WHAT IS CLAIMED IS:

1. A method of starting an internal combustion engine, wherein the engine includes a plurality of cylinders each containing a piston which is mechanically connected to a crankshaft, and wherein the engine is configured to operate with a predefined normal firing order, the method comprising:

selecting at a cylinder for initial firing, selection of the cylinder based upon the piston of the cylinder being located in a predetermined position along its stroke;

injecting fuel into the selected cylinder to create an uncompressed fuel-air mixture;

igniting the uncompressed fuel-air mixture in the selected cylinder;

repeating said selecting, injecting and igniting until there is sufficient kinetic energy to complete a compression stroke in at least one of the cylinders, the selecting being made as a function of cylinder piston position without regard to normal firing order; and

after completion of a compression stroke, firing the cylinders according to the predefined normal firing order.

2. The method of claim 1 further comprising:

adjusting a dynamic compression ratio of the selected cylinder by adjusting valve event parameters of the selected cylinder prior to firing the cylinder according to the normal firing order.

3. The method of claim 1, wherein the predetermined piston position of the cylinder selected for initial firing is a position where the piston has sufficient mechanical advantage to rotate the crankshaft through at least 180 degrees in response to igniting the mixture in the first selected cylinder.

4. The method of claim 3, wherein the predetermined piston position of the cylinder selected for initial firing is a position selected to have sufficient mechanical advantage to rotate the crankshaft in a counter-clockwise direction.

5. The method of claim 3, wherein the predetermined piston position of the cylinder selected for initial firing is a position selected to have sufficient mechanical advantage to rotate the crankshaft in a clockwise direction.

6. The method of claim 3 wherein the predetermined piston position of the cylinder selected for initial firing is in a range between 25 and 155 crankshaft degrees after top dead center.

7. The method of claim 1, wherein after igniting the cylinder selected for initial firing, the piston of the selected cylinder moves towards bottom dead center.

8. The method of claim 7 further comprising:

opening an exhaust valve when piston moves away from bottom dead center toward top dead center.

9. The method of claim 8, wherein the exhaust valve remains open until the piston reaches approximately top dead center.

10. The method of claim 1 further comprising:

selecting a plurality of cylinders for initial firing, selection of each cylinder based upon the piston of the respective cylinder being located in a predetermined position along its stroke.

11. The method of claim 1 further comprising:

prior to firing the cylinder selected for initial firing, closing an intake valve.

12. The method of claim 11 further comprising:

prior to firing the cylinder selected for initial firing, closing an exhaust valve.

13. The method of claim 1, wherein the fuel is injected to form a combustible mixture with a fuel/air ratio approximately stoichiometric.

14. The method of claim 1, wherein the fuel is injected via direct injection into the selected cylinder from an associated injector.

15. The method of claim 1, wherein the engine is configured to normally operate on a four-stroke combustion cycle.

16. The method of claim 1 further comprising:

before igniting the uncompressed fuel-air mixture in a selected cylinder, opening an intake valve to introduce a fresh charge into the selected cylinder.

17. The method of claim 1 wherein said selecting, injecting and igniting occurs while the cylinders are fired according to the predefined normal firing order.

18. A method of reducing the speed of an internal combustion engine having a plurality of cylinders each housing a piston and each having an intake valve and an exhaust valve, wherein intake and exhaust valve are each controllable independently of engine rotation, the method comprising:

determining a first speed of the engine;

estimating an amount of pumping work sufficient to reduce the speed of the engine to a second speed;

actuating one or more valves to produce at least part of the estimated amount of pumping work within the engine; and

reducing the speed of the engine to the second speed.

19. The method of claim 18 further comprising:

determining a number of piston strokes sufficient to reduce the speed of the engine from the first speed to the second speed.

20. The method of claim 19 wherein the determined number of piston strokes is a minimum number of strokes required to reduce the engine speed from the first speed to the second speed.

21. The method of claim 19 further comprising:

determining an amount of pumping work required for each determined number of strokes to reduce the speed of the engine from the first speed to the second speed.

22. The method of claim 18 further comprising:

determining a desired timing of the valves to produce the estimated amount of pumping work.

23. The method of claim 18 further comprising:

determined a desired amount of lift of the valves to produce the estimate amount of pumping work.

24. The method of claim 22 wherein determining the desired valve timing comprises:

dynamically determining the desired valve timing required to produce the estimated amount of pumping work.

25. The method of claim 22 wherein determining the desired valve timing comprises:

accessing pre-stored data indicating the desired valve timing required to produce the estimated amount of pumping work.

26. The method of claim 18 further comprising:

estimating an amount of friction work in one or more of the cylinders of the engine and wherein the estimated amount of pumping work is a function of the estimated amount of friction work.

27. The method of claim 18, wherein the second speed is zero and the first speed is a speed within a range of predetermined speeds, for which it has been determined that the engine may be stopped in one braking stroke using pumping work such that the crankshaft will stop within a desired range of crankshaft angles.

28. The method of claim 18, wherein the second speed is greater than zero, the method further comprising:

estimating a second amount of pumping work sufficient to reduce the second speed to zero in one braking stroke; and

after reducing the speed of the engine to the second speed, actuating one or more valves to produce at least part of the second amount of pumping work within the engine, reducing the engine speed to zero.

29. The method of claim 18, wherein the actuated valves include both intake and exhaust valves.

30. The method of claim 29 further comprising:

opening and then closing all the actuated valves at approximately bottom dead center and top dead center.

31. The method of claim 18, wherein actuating one or more valves to produce the estimated amount of pumping work comprises:

determining the position of a piston within a cylinder;

opening the valve when the piston is at a first position; and

closing the valve when the piston is at a second position, wherein the first and second positions depend upon the entering speed of the engine.

32. The method of claim 18 wherein estimating the amount of pumping work required to reduce the speed of the engine from a first speed to a second speed comprises:

estimating the amount of pumping work required to reduce the engine speed to a second speed of zero such that at least one piston stops at a predetermined location.

33. The method of claim 32 wherein the predetermined location is anywhere between 25 and 155 degrees after top dead center.

34. A method of stopping an internal combustion engine having a plurality of cylinders, each cylinder including a controllable valve actuation system for operating one or more valves of the cylinder, the method comprising:

determining a range of speeds in which the engine may be stopped in one braking stroke using pumping work such that the crankshaft will stop within a desired range of crankshaft angles; and

actuating the valve actuation system to produce pumping work in the cylinders to stop the engine in one braking stroke when the engine's speed has reached a target speed that is within the determined range of speeds.

35. The method of claim 34 wherein the desired range of crankshaft angles is a range of positions where at least one piston has sufficient mechanical leverage to rotate the crankshaft in a clockwise direction.

36. The method of claim 34 wherein the desired range of crankshaft angles is a range of positions where at least one piston has sufficient mechanical leverage to rotate the crankshaft in a counter-clockwise direction.

37. The method of claim 34 further comprising:

prior to actuating the valve actuation system to stop the engine, estimating an amount of pumping work required to reduced the speed of the engine from a first speed to the target speed.

38. The method of claim 37 further comprising:

determining a number of strokes sufficient to reduce the speed of the engine from the first speed to the target speed.

39. Them method of claim 38 further comprising:

actuating the valve actuation system to produce the estimated pumping work required to reduce the speed of the engine from a first speed to the target speed.

40. The method of claim 38 further comprising:

distributing the estimated pumping work evenly among the determined number of strokes required to reduce the entering speed to the target speed.

41. The method of claim 34 further comprising estimating an amount of friction work in one or more of the cylinders.

42. The method of claim 41 wherein estimating an amount of friction work comprises:

prior to actuating the valve actuation system, predicting a residual speed of the engine;

after actuating the valve actuation system, comparing the actual residual speed to the predicted residual speed; and

estimating the friction work based on the difference between the actual residual speed and the predicted residual speed.

43. The method of claim 41 wherein estimating the amount of friction work comprises:

applying a minimum amount of pumping work to a cylinder in a stroke;

sampling the engine speed during the stroke; and

estimating the amount of friction work based on the change in engine speed during the stroke.

44. The method of claim 34 further comprising:

after the engine has stopped, adjusting the crank angle of the engine by actuating the valve actuation system to release a compressed or vacuumed cylinder.

45. An internal combustion engine comprising:

a cylinder housing a piston attached to a crankshaft;

an intake valve that controls the intake of air into the cylinder;

an exhaust valve that controls the expulsion of air from the cylinder;

an intake valve actuator that controls operation of the intake valve;

an exhaust valve actuator that controls operation of the exhaust valve; and

a valve control module that, upon receiving a command to stop the engine, adaptively controls the intake valve actuator and exhaust valve actuator to produce pumping work to stop the engine such that the crankshaft will stop within a desired range of crankshaft angles.

46. The engine of claim 45 wherein the valve control module is configured to, upon receiving a command to stop the engine, adaptively control the intake valve actuator and exhaust valve actuator to produce pumping work to reduce the engine from a first speed to a second speed, wherein the second speed is within a predetermined range of speeds for which it has been determined that the engine may be stopped in one braking stroke using pumping work such that the crankshaft will stop within a desired range of crankshaft angles.

47. The engine of claim 45 further comprising:

an ignition element disposed at least partially within the cylinder that ignites fuel within the cylinder;

a fuel injection element disposed at least partially within the cylinder that injects a suitable amount of fuel into the cylinder; and

an ignition and fuel injection control module that stops the injection and ignition of fuel upon receiving a command to stop the engine.

48. An internal combustion engine comprising:

a cylinder housing a piston attached to a crankshaft;

an intake valve that controls the intake of air into the cylinder;

an exhaust valve that controls the expulsion of air from the cylinder;

an intake valve actuator that controls operation of the intake valve;

an exhaust valve actuator that controls operation of the exhaust valve; and

a starting module that identifies one or more cylinders with pistons in a predetermined position range, selects the identified cylinders independently of their normal operating stroke cycles, and fires the identified cylinders.

49. The engine of claim 48 wherein the starting module is configured to start the engine in forward or reverse.

50. A method of starting a four-stroke internal combustion engine from rest, wherein the engine includes a plurality of cylinders each containing a piston, the method comprising:

operating a first number of the plurality of cylinders in a two-stroke cycle that does not compress fuel-air mixture prior to combustion; and

after sufficient kinetic energy has accumulated in the engine to complete a compression stroke, then operating simultaneously a second number of the plurality of cylinders in a normal four-stroke cycle.

51. The method of claim 50 further comprising:

ceasing operation of a first number of cylinders in the two-stroke cycle while continuing operation of a second number of cylinders in a normal four-stroke cycle.

52. The method of claim 50 wherein the two stroke cycle includes a first stroke that introduces a fresh charge and a second stroke that releases combustion residue.